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Final Report
on
**Contract No. N00014-89-C-0081**

# Investigation of OBS Bottom-Coupling Characteristics and Excess Noise

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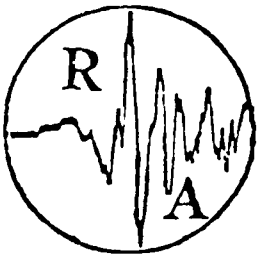


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The scientific objectives of this research were to perform coupling/noise OBS field tests designed to provide quantitative estimates of the coupling distortion and excess noise to be expected from high quality newly designed OBS's; to provide data required for transfer functions to compensate for the coupling distortion; and to suggest further improvements in instrumentation design and deployment procedures. The specific objectives of this contract were to organize and conduct field test and analyses of the bottom coupling characteristics and excess noise of new and renovated ocean-bottom seismographs. This research was in support of the instrument development being conducted under the ONR Accelerated Research Initiative (ARI) on ULF/VLF Ocean Seismo-acoustics. It was conducted in close cooperation with A. Tréhu of Oregon State University.

Signal distortion and excess noise from bottom currents, especially on the horizontal components, have continually plagued OBS users. There is disagreement within the community on how serious the problems are and on the best way to improve the situation. The OBS intercomparison tests conducted at Lopez Island in 1978, over ten years ago (Sutton *et al.*, 1981), and a few subsequent studies have suggested improved design concepts. Shallow burial and proper packaging and density distribution should greatly improve coupling, especially for horizontal components. It should also reduce noise induced by bottom currents (Sutton and Duennebier, 1987). Possible noise and signal distortion produced by a separated recording package also is not well understood at this time.

Because of delays in development of the new ONR OBS, tests originally scheduled for spring were conducted in November. Those and subsequent series of experiments are designed to measure: (1) the coupling characteristics of the new ONR OBS; (2) the seismic energy radiated from the main package of the ONR OBS as a function of frequency and distance from the seismometer package; (3) the effect of near-bottom currents on OBS-seafloor coupling of the new sensor package and on the radiation of energy from the main package; and (4) the effects of shallow burial on signal distortion and noise. The results from these tests should permit us to compare the coupling response of the new ONR and other OBS in order to correct for differences between instruments in subsequent seafloor experiments using arrays comprised of different types of OBS. The results will also enable us to estimate how far the sensor package should be deployed from the main recording package for the ONR OBS.

Research conducted under this contract included planning, preparation for, and conduct of the November field tests. A related paper was prepared and published (Sutton and Duennebier, 1989).

## *REFERENCES*


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Sutton, G. H. and F. K. Duennebier, "Avoiding signal distortion and excess noise in OBS," *Proceedings of a Workshop on Exploration of Deep Continental Margin Crust with Closely Spaced Shots and Receivers*, pp. A21-A22 (with 4 pp. of figures), Houston Area Research Center, M. Talwani, P. L. Stotta, and W. D. Mooney, ed., 1989.

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